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Indian Standard
ELECTROTECHNICAL VOCABULARY
PART IV ELECTRON TUBES
Section 8 Photosensitive Devices

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PART IV ELECTRON TUBES
Section 8 Photosensitive Devices

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Indian Standard
ELECTROTECHNICAL VOCABULARY
PART IV ELECTRON TUBES
Section 8 Photosensitive Devices

0. FOREWORD

0.1 This Indian Standard (Part IV/Sec 8) was adopted by the Indian Standards Institution on 29 November 1973, after the draft finalized by the Electrotechnical Standards Sectional Committee in consultation with the Electron Tubes Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard deals with terms and definitions relating to photosensitive devices.

0.3 This standard is one of a series of Indian Standards on electrotechnical vocabulary. A list of standards so far published in this series is given on page 14.

1. SCOPE

1.1 This standard (Part IV/Sec 8) covers terms and definitions relating to photosensitive devices.

1.1.1 The following types of photosensitive devices are included:

a) Vacuum photo tubes,
b) Gasfilled photo tubes,
c) Photoconductive cells,
d) Photovoltaic cells, and
e) Photomultipliers.

2. PHOTOELECTRIC EFFECTS

2.1 Photoelectric Effect — Interaction between radiation and matter resulting in the absorption of photons and the consequent electrical phenomena.

2.2 Photoemissive Effect — Photoelectric effect characterized by the emission of electrons.

2.3 Photovoltaic Effect — Photoelectric effect characterized by the appearance of an electromotive force.

2.4 Photoconductive Effect — Photoelectric effect characterized by the variation of electric conductivity.

3. DEVICES

3.1 Photosensitive Device/Photoelectric Device — A device (a cell or a tube) the functioning of which is determined by the photoelectric effect.

3.2 Integrating Photosensitive Device/Photocell — A photosensitive device in which the effect of the incident radiation is integrated over the entire sensitive area.

3.3 Photoemissive Cell/Photo Tube — A photosensitive device in which the photoemissive effect is utilized.

3.4 Photovoltaic Cell — A photosensitive device in which the photovoltaic effect is utilized.

3.5 Photoconductive Cell — A photosensitive device in which the photoconductive effect is utilized.

3.6 Vacuum Photo Tube — A photo tube evacuated to such a degree that its current is due to photo electron emission only.

3.7 Gasfilled Photo Tube — A photo tube which utilizes gas multiplication effect of contained gas.

3.8 Photomultiplier/Multiplier Photo Tube — A photosensitive vacuum device comprising a photoemissive cathode and an electron multiplier system.

4. RADIATION AND LIGHT QUANTITIES

4.1 Radiant Energy — *See* **2.2.4** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.2 Radiant Flux/Radiant Power — *See* **2.2.5** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.3 Radiant Intensity of a Source in a Given Direction — *See* **2.2.7** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.4 Irradiation — *See* **2.1.2** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.5 Light — *See* **6.2.4** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.6 Luminous Flux — *See* **3.3** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.7 Lumen — *See* **3.4** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.8 Luminous Intensity of a Source in a Given Direction — *See* **3.10** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.9 Candela — *See* **3.11** of IS : 1885 (Part XVI/Sec 1)-1968*.

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*Electrotechnical vocabulary: Part XVI Lighting; Section 1 General aspects.

4.10 Illuminance (Illumination) at a Point of a Surface — *See* **3.18** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.11 Lux, Lumen Per Square Metre — *See* **3.19** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.12 Primary Standard of Light — Standard light source reproducible from a specification by which the unit of light is established [*see* **7.1** of IS : 1885 (Part XVI/Sec 1)-1968*].

NOTE — The present international standard is a full radiator at the temperature of freezing platinum.

4.13 Secondary Standard of Light — Constant and reproducible light source, the luminous intensity (or the luminous flux or the luminance) of which has been determined directly or indirectly by comparison with the primary standard [*see* **7.2** of IS : 1885 (Part XVI/Sec 1)-1968*].

4.14 Working Standard of Light — Light source in regular use which is calibrated from time to time by reference to a secondary standard [*see* **7.3** of IS : 1885 (Part XVI/Sec 1)-1968*].

4.15 Distribution Temperature — *See* **2.3.13** of IS : 1885 (Part XVI/Sec 1)-1968*.

4.16 Colour Temperature — Temperature of the full radiator which emits radiation of the same chromaticity as the radiation considered [*see* **2.3.14** of IS : 1885 (Part XVI/Sec 1)-1968*]. Unit: degree Kelvin (°K).

NOTE — The corresponding relative spectral distribution curves may not be similar, but there will be a metameric match.

4.17 CIE Standard Illuminants — The colorimetric illuminants A, B, C and D 6 500, defined by CIE in terms of relative spectral energy distribution [*see* **4.28** of IS : 1885 (Part XVI/Sec 1)-1968*]:

a) Standard illuminant A, representing the Planckian radiator to 2 854°K.
b) Standard illuminant B, representing direct sunlight with a correlated colour temperature of 4 870°K.
c) Standard illuminant C, representing daylight with a correlated colour temperature of 6 770°K.
d) Standard illuminant D 6 500, representing daylight with a correlated colour temperature of 6 500°K.

5. ELECTRICAL QUANTITIES

5.1 Photoelectric Current/Photo Current — The change in output current from the photo-cathode caused by the incident radiation.

---

*Electrotechnical vocabulary: Part XVI Lighting; Section 1 General aspects.

5.2 Illumination Current — The current which passes when a voltage and illumination are applied to the device.

5.2.1 *Equilibrium Illumination Current* — For a particular set of conditions, the illumination current after such a time, under these conditions, that the rate of change of the illumination current is less than a specified percentage per specified time (for example, 1 percent per 5 minutes for photoconductive cells in visible spectrum).

5.2.2 *Initial Illumination Current* — For particular set of conditions, the first virtually constant value of the illumination current after a period of storage or stated operating conditions.

NOTE — The initial illumination current usually occurs after a few seconds under the particular conditions.

5.3 Dark Current — The output current of a photosensitive device in the absence of intended irradiation.

NOTE — This is due to the effects of ambient temperature.

5.3.1 *Equilibrium Dark Current* — For a particular set of conditions, the dark current after such a time, under these conditions, that the rate of change of the dark current is less than a specified percentage per specified time (for example, 2 percent per 5 minutes for photoconductive cells used in visible spectrum).

5.3.2 *Initial Dark Current* — For a particular set of conditions, the dark current after a stated time, under these conditions, immediately following a stated history.

5.4 Frequency Response Characteristic — The relation, usually shown by a graph, between the radiant (or luminous) dynamic sensitivity and the modulating frequency of the incident radiation.

5.5 Transient Decay Current — The decreasing current in the device after the irradiation has been abruptly cut off.

5.6 Equivalent Dark Current Irradiation — The value of incident radiation required to give a dc signal output current equal to the dark current.

5.7 Equivalent Noise Irradiation — The value of incident radiation that when modulated in a stated manner, produces a signal output power equal to the noise power, both in a stated bandwidth.

5.8 Quantum Efficiency — The ratio between the number of emitted photo-electrons and the number of incident photons.

5.8.1 *Quantum Efficiency Characteristic* — The relation, usually shown by a graph, between wavelength and quantum efficiency.

5.9 Resistance Under Illumination — The ratio between the voltage across the device and the current through the device under stated illuminance.

5.9.1 *Equilibrium Resistance Under Illumination* — For a particular set of conditions, the resistance under illumination after such a time, under these conditions, that the rate of change of the resistance under illumination is less than a specified percentage per specified time (for example, 1 percent per 5 minutes for photoconductive cells used in visible spectrum).

5.9.2 *Initial Resistance Under Illumination* — For a particular set of conditions, the first virtually constant value of the resistance under illumination after a period of storage or stated operating conditions.

NOTE — The initial illumination resistance usually occurs after a few seconds under the particular conditions but it is sometimes more practical to make the measurement on specific types of devices after a stated time interval.

5.10 Dark Resistance — The ratio between the voltage across the device and the current through the device in the absence of illuminance.

NOTE — This is due to the effects of ambient temperature.

5.10.1 *Equilibrium Dark Resistance* — For a particular set of conditions, the dark resistance after such a time, under these conditions, that the rate of change of the dark resistance is less than a specified percentage per specified time (for example, 2 percent per 5 minutes for photoconductive cells used in visible spectrum).

5.10.2 *Initial Dark Resistance* — For a particular set of conditions, the dark resistance after a stated time, under these conditions, immediately following a stated history.

5.11 Saturation Voltage — The lowest operating voltage which causes no change, or only a slight change, of the photocurrent when this voltage is increased under conditions of given constant radiation.

5.12 Saturation Current

5.12.1 *Irradiation Saturation Current* — The output current that is not changed significantly by an increase of irradiance under constant operating conditions.

5.12.2 *Voltage Saturation Current* — The output current that is not changed significantly by an increase of voltage under constant irradiance.

5.13 Collection Efficiency — The ratio between the number of useful electron reaching the anode or first dynode and the number of electrons emitted by the photo-cathode.

6. SENSITIVITY

6.1 Radiant Power Sensitivity

a) The ratio between the photoelectric current of the device and the incident radiant power, usually expressed in amperes per watt.

b) The ratio between the photoelectric current of the device and the incident irradiance, usually expressed in amperes per watt per square metre.

NOTE — Radiant power sensitivity is, however, expressed in terms of microamperes per square millimetre or microamperes per microwatt per square millimetre.

6.2 Absolute Spectral Sensitivity — The radiant power sensitivity for monochromatic radiation of a stated wavelength.

6.3 Relative Spectral Sensitivity — The ratio between the radiant sensitivity at any considered wavelength and the radiant sensitivity at a certain wavelength taken as reference, usually the wavelength of maximum response.

NOTE — For nonlinear devices, it is necessary to refer to constant photoelectric current at all wavelengths.

6.4 Luminous Sensitivity

a) The ratio between the photoelectric current of the device and the incident luminous flux, usually expressed in microamperes per lumen.
b) The ratio between the photoelectric current of the device and the incident illuminance, usually expressed in amperes per lux.

6.5 Dynamic Sensitivity — Under stated conditions of operation, the ratio between the variation of the photoelectric current of the device and the small variation of the initiating incident radiant power (or luminous flux).

6.6 Spectral Sensitivity Characteristic — Relation, usually shown by a graph, between wavelength and absolute or relative spectral sensitivity.

6.6.1 *Absolute Spectral Sensitivity Characteristic* — Relation, usually shown by a graph, between wavelength and absolute spectral sensitivity.

6.6.2 *Relative Spectral Sensitivity Characteristic* — Relation, usually shown by graph, between wavelength and relative spectral sensitivity (*see* Fig. 1).

7. TIME QUANTITIES

7.1 Rise Time — The time required for the photoelectric current to rise from a stated low percentage to a stated higher percentage of the maximum value when a steady state of radiation is instantaneously applied.

NOTE — It is usual to consider the 10 percent and 90 percent levels.

7.2 Fall Time — The time required for the photoelectric current to fall from a stated high percentage to a stated lower percentage of the maximum value when the steady state of radiation is instantaneously removed.

NOTE — It is usual to consider the 90 percent and 10 percent levels.

7.3 Signal Transit Time — The time interval between the arrival of a delta light pulse of a stated amplitude at the entrance window of the device and the time at which the output pulse reaches a stated value.

7.4 Transit Time Spread — The variation in the times of occurrence of a stated point on the output current pulses arising from the application of delta light pulses at various points of the entrance window of the device.

7.5 Transit Time Jitter — The variation in the times of occurrence of a stated point on the output current pulses arising from the application, to the photo-cathode, of delta light pulses each giving rise to not more than a single photoelectron.

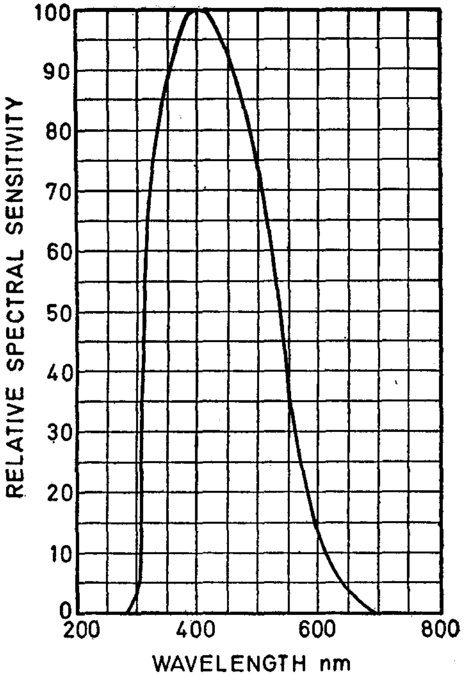

Fig. 1 Typical Relative Spectral Sensitivity Characteristic of a Photosensitive Device

7.6 Response Pulse Duration — The time duration between the half amplitude points of the output current pulse when the photo-cathode receives a delta light pulse giving rise to a large number of photoelectrons.

7.7 Delta Function Light Input/Delta Light Pulse — A pulse having finite integrated light flux and infinitesimal width.

8. MISCELLANEOUS

8.1 Threshold Wavelength — The wavelength of the incident radiant energy above which there is no photoelectric effect.

8.2 Threshold Frequency — The frequency of incident radiant energy below which there is no photoelectric effect.

8.3 Photoelectric Emission — Electron emission caused directly by the incident radiant energy.

8.4 Photo-Cathode — A cathode that functions by photoelectric emission.

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NOTE — This index has been prepared in accordance with IS: 1275-1958*. Index numbers are clause numbers.

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- (Part III/Sec 2)-1966 Acoustics; Section 2 Acoustical and electro-acoustical system
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